Function : relationship in which each input has only one output.

↳ VLT : "vertical line test" checks whether or not a graph is a function. If a vertical line passes through more than one point at any part of the graph it is not a functio

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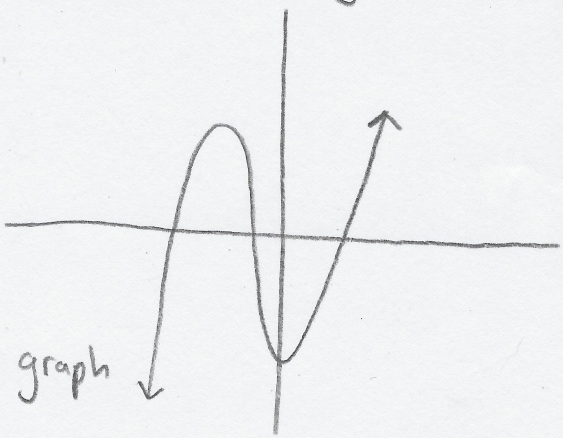
① POLYNOMIAL FUNCTIONS

↳ polynomial : equation involving variables and exponents in which a constant is multiplied by at least one variable raised to a nonnegative integral power.

$y = ax^2 + bx + c$

- ax^2: leading coefficient / rate of change
- bx: factor to find zeroes
- c: y-intercept



*to graph / make equation from graph

note...

end behavior: up-up, down-down (even highest exponent (ex. x^4)); up-down, down-up (odd highest exponent (ex. x^3))

zeroes: x-intercepts

multiplicities: "bounces" at x-intercept, signifying repeats

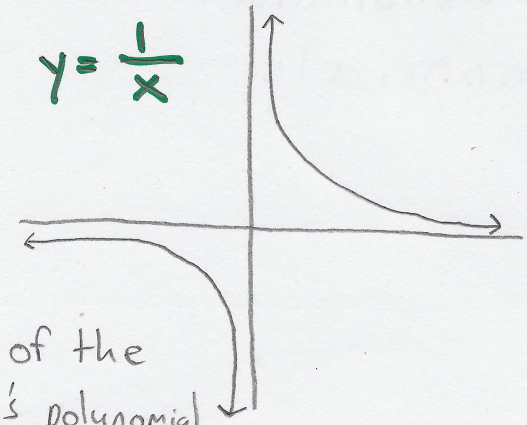
y-intercept: the constant "c"

neg/pos slope: "a" is negative if down-down, up-down. positive if otherwi

② RATIONAL FUNCTIONS

equation of a rational fraction, or, a fraction containing variables in its denominator.

$y = \frac{1}{x}$



* to graph/find equation from graph, note...

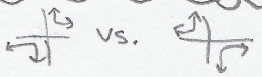
vertical asymptotes the zeroes of the denominator's polynomial

horizontal asymptotes
- 0, if top highest exponent > bottom's highest
- $\frac{\text{top leading coefficient}}{\text{bottom leading coefficient}}$ if exponents are equal
- does not exist if top highest exponent < bottom

y-intercept

Zeroes x-intercepts of numerator

positive/negative according to the leading coefficient

 vs.

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③ EXPONENTIAL FUNCTIONS

equation in which "x" itself is an exponent.

$y = b^x$

* to graph/find equation from graph, note...

rate of change up 1, 3, 5 and so on is the normal exponential growth rate. Different rate means manipulation (·/÷/+/-) of the equation.

negative/positive

horizontal asymptote

shifts vertical or horizontal

4 LOGARITHMIC FUNCTIONS

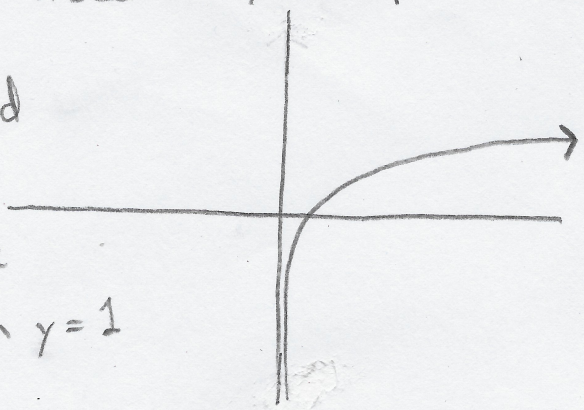
inverse equation of an exponential function. y is the exponent that the constant base must be raised to, to produce x.

$y = \log_b x$ $(b^y = x)$

* to graph/find equation, note...

vertical asymptote

base x-value when $y = 1$



practice

6. Explain how, like exponential and logarithmic functions, polynomial and rational function equations and graphs are or are not inverse forms of each other.

7. Identify key features of each equation necessary for graphing:

a) $y = 2x^4 + x^3 - 2x^2 + x$

b) $y = \dfrac{4x^2 - 1}{16x^2 - 4}$

7. a) end behavior = up-up
Zeroes = $-\frac{1}{2}, \frac{1}{2}, -1, 0$ multiplicities = $\emptyset$
y-intercept = 0

b) horizontal asymptote = $\emptyset$
vertical asymptote = $\frac{1}{2}, -\frac{1}{2}$
positive $\neq$

6. Polynomial equations such as $y = x^3$ and rational functions such as $y = \frac{1}{x^3}$ aren't inverses because when algebraically solved $y = x^3 \rightarrow x = \sqrt[3]{y} \rightarrow y = \sqrt[3]{x}$ is $y = x^{\frac{1}{3}}$, not $y = x^{-3}$, which would be $y = \frac{1}{x}$, a rational function